



Characterization of Blended Areca Palm And Snake Plant Fiber as Textile Material

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Abstract: Growing interest in sustainable and eco-friendly materials has driven research into locally available plant fibers as viable alternatives to conventional textiles. This study aimed to develop and characterize an innovative textile material produced by blending fibers from Areca Palm (*Areca catechu*) and Snake Plant (*Sansevieria trifasciata*) fibers, with the aim of assessing its mechanical, chemical, and sensory properties. A developmental research design, the study followed a systematic process including fiber extraction, blending, handloom weaving, and comprehensive performance evaluation. Sensory assessment was conducted by 25 qualified evaluators, while laboratory tests were performed to measure physical and chemical characteristics. Mechanical testing results showed that the blended textile exhibited moderate elasticity, with a mean breaking elongation of 24.67%, classified as “less elastic”, while maintaining a high tensile strength of 44.75 N/mm², interpreted as “very durable”. Chemical assessments indicated a controlled burning rate of 0.072 in²/sec, high washability with no observable deformation after 30 minutes of soaking, and water absorption of 71%, classified as absorbent. Sensory evaluation, conducted by 25 expert evaluators, yielded very acceptable ratings for hand feel, rib irregularity, color shade, and plug presence, resulting in a “very acceptable” rating. These findings demonstrated that the blended textile successfully balances flexibility, strength, moisture management, flame resistance, and aesthetic appeal.

Keywords: Blended Textile, Areca Palm, Snake Plant, Mechanical Properties, Chemical Properties, Sustainable Fibers

I. INTRODUCTION

Textile production has long been recognized as a cornerstone of human innovation, reflecting the dynamic interplay between technological advancement and cultural adaptation. The textile industry has historically been driven by innovations in fiber technology, which have shaped both societal development and economic growth (Scott, 2016). In contemporary practice, the focus has shifted toward sustainable alternatives that balance environmental responsibility with functional performance. This study investigated the development of a blended textile composed of Areca Palm (*Areca catechu*) and Snake Plant (*Sansevieria trifasciata*) to evaluate their potential as eco-friendly, durable, and cost-effective materials for textile production.

Globally, there is a growing concern over the environmental impact of synthetic textiles, which are non-biodegradable and contribute to pollution and resource depletion. This has spurred extensive research into natural plant fibers as eco-friendly substitutes, as they are renewable, biodegradable, and have a lower carbon footprint (Kalia et al., 2011; Pickering, 2016). Countries around the world are exploring various indigenous plant fibers to develop textiles that are both durable and environmentally sound. The trend toward blended fabrics has also gained attraction intentionally, as combining different fibers allows manufacturers to enhance mechanical properties, improve comfort, and reduce production costs, addressing both environmental and economic demands (Alimuzzaman et al., 2014).

In the Philippines, the textile industry has a rich heritage rooted in the use of natural fibers, and there is a renewed interest in reviving and modernizing this sector through sustainable practices. The country is blessed with abundant agricultural and plant resources, making it well-positioned to produce eco-friendly textile materials (Delariarte et al., 2020). Government agencies and research institutions are actively promoting the utilization of local fibers to support sustainable development, create livelihood opportunities, and reduce reliance on imported synthetic materials. Studies on indigenous fibers have already shown their potential in textile production, and the exploration of other locally available plants aligns with the national goal of developing innovative, cost-effective, and sustainable materials (DOST, 2021).

In the province of Antique and the broader Western Visayas Region, Areca Palm and Snake Plant are widely available and commonly grown in residential areas, farms, and open lands.



II. METHODOLOGY

Phases	Description
Phase I	Evaluation Design
Phase II	Experimentation
Phase III	Analysis

METHODS OF RESEARCH

This study utilized a developmental research approach. This method was specifically chosen because it was designed to create new products or materials and test their performance simultaneously. It allowed the researcher not only to produce the blended textile prototype but also to improve and refine the process step by step while gathering valid data on its qualities. This aligns perfectly with the goal of the study, which is to develop and characterize a new textile material, ensuring that the output is both functional and based on scientific evidence (Prasad & Mukherjee, 2021). The core of the methodology involved using Areca Palm (*Areca catechu*) and Snake Plant (*Sansevieria trifasciata*) fibers, combined in a 50:50 weight ratio. Equal proportions were adopted intentionally to ensure that each fiber type contributed equitably to the resulting material's physical and aesthetic properties. Blending fibers in balanced ratios was commonly practiced in textile research to achieve synergistic performance 69 70 outcomes, such as improved tensile strength, enhanced flexibility, and optimized surface texture that might not be attainable with single-fiber systems (Joseph & Gupta, 2020). Following the blending process, the mixed fibers were aligned and interlaced into a textile sheet through controlled hand weaving. This stage exemplified the developmental focus of the study, as iterative adjustments in fiber preparation and integration were made to achieve consistent fabric formation. Once the prototype was fabricated, the material underwent a series of mechanical and chemical evaluations. Mechanical testing measured tensile strength and breaking elongation, both essential indicators of durability and load-bearing capacity under tension.

Methodology: Phase I Evaluation Design, Evaluation Instruments

The development of the blended Areca Palm (*Areca catechu*) and Snake Plant (*Sansevieria trifasciata*) textile was guided by a set of carefully defined design criteria to ensure that the final material would be functional, aesthetically acceptable, and suitable for practical applications. The textile was composed of a 50:50 blend of Areca Palm and Snake Plant fibers, intended to balance strength and flexibility while maintaining uniformity through proper cleaning, drying, and fiber alignment before weaving. Mechanically, the fabric was designed to exhibit adequate tensile strength to withstand handling and light fabrication processes, along with sufficient elongation to allow flexibility without permanent deformation. Chemically and environmentally, the textile was required to demonstrate controlled water absorption, stable dimensional behavior, and predictable thermal properties, including a manageable burning rate, as well as the ability to withstand washing without significant deterioration in texture or structure. Aesthetic and sensory qualities were also prioritized, with the goal of producing a fabric with a uniform color shade, regular ribs, minimal fiber clumps, and a comfortable hand feel that reflects the natural characteristics of the blended fibers. In terms of practical feasibility, the design needed to be compatible with hand-weaving techniques, manageable in sheet form, and suitable for prototype testing, educational demonstrations, craft products, or basic apparel applications. Finally, sustainability considerations were incorporated by using locally 72 sourced, renewable fibers and minimizing chemical or energy-intensive processing, thereby aligning the textile's development with eco-friendly, environmentally responsible practices. Together, these criteria guided the systematic fabrication and evaluation of the blended textile, ensuring that it met the intended functional, structural, and aesthetic objectives of the study.

Tools and Equipment Used in the Study

The development and evaluation of the blended Areca Palm (*Areca catechu*) and Snake Plant (*Sansevieria trifasciata*) textile utilized a range of tools and equipment to facilitate fiber extraction, weaving, and performance testing. For fiber preparation, one (1) bolo was used to cut the leaf sheaths of Areca Palm and the leaves of Snake Plant, while one (1) fine-toothed comb was used to scrape the outer layers of the fibers. One (1) pair of scissors was employed to trim the fibers to uniform lengths. To soften the fibers, a large plastic water container was used for soaking, and a solid wooden block measuring 12 × 18 × 3 inches was used to pound the fibers and loosen the strands. Blended fibers were stored in a medium-sized container to prevent moisture damage, while a bobbin winder and shuttle were used to prepare the fibers for weaving. During testing, elongation and breaking force were measured using a spring balance, while water absorption and washability experiments were facilitated with a graduated cylinder and three (3) beakers. Controlled



burning tests were conducted with a crucible tong, tweezers, and an alcohol lamp. Dimensional and weight measurements were obtained using a vernier caliper and a digital balance. The weaving process was performed on a handloom measuring 30 × 60 inches, and tensile strength was determined with a Universal Testing Machine. Collectively, these tools and equipment ensured precise fiber processing, consistent textile fabrication, and reliable mechanical, chemical, and sensory evaluation of the blended textile. Using standardize tools and methods allowed for consistent results, ensuring that the entire process could be repeated and verified in future studies or practical applications.

DEVELOPMENTAL TREATMENT

Table 1 presents the tensile strength performance of blended fibers derived from Areca Palm and Snake Plant. The results were analyzed to determine their durability and suitability as classifications. alternative textile materials using standardized tensile-strength For the Areca Palm fibers, tensile strength values across the three (3) samples were 34.3, 34.3, and 36.95 N/mm², yielding a mean of 34.95 N/mm². Based on the established rating scale, this value fell within the “Durable” range. The uniform fiber load of 10 kgf applied to all samples indicated consistent testing conditions. The relatively stable tensile values suggested that Areca palm fibers possessed moderate structural integrity, making them capable of withstanding mechanical stress during textile use. Previous investigations into palm-based natural fibers reported comparable tensile ranges, emphasizing their suitability for semi-structural and textile reinforcement applications (Kumar et al., 2019; Ramesh et al., 2018). In contrast, the Snake plant fibers demonstrated higher tensile strengths of 49, 48.02, and 39.2 N/mm², yielding a mean of 40.83 N/mm². This mean value corresponded 94 95 to the “Very Durable” classification. Although one sample showed a slightly lower value, the overall performance indicated superior mechanical strength compared to Areca palm fibers. The literature has consistently reported that Sansevieria trifasciata fibers possess high cellulose content and strong microfibrillar orientation, which contribute to enhanced tensile performance (Sathishkumar et al., 2020; Thakur & Thakur, 2017).

Table 1. Tensile Strength of Blended Areca Palm and Snake Plant as an Alternative Textile Material.

Fiber	Parameters	Sample 1	Sample 2	Sample 3	Mean	Verbal Interpretation
Areca Palm fibers	Tensile Strength of (N/mm ²)	34.3	34.3	36.95	34.95	Durable
	Fiber Load (Kgf)	10	10	10	–	–
Snake plant fibers	Tensile Strength of (N/mm ²)	49	48.02	39.2	40.83	Very Durable
	Fiber Load (Kgf)	10	10	10	–	–
Combination of 2 Fiber	Tensile Strength of (N/mm ²)	44.1	45.08	45.08	44.75	Very Durable
	Fiber Load (Kgf)	10	10	10	–	–

Legend:

<i>Tensile Strength (N/mm²)</i>	<i>Verbal Interpretation</i>
40.21-50	Very Durable
30.41-40.20	Durable
20.61-30.40	Moderately Durable
10.81-20.60	Less Durable
1.00-10.80	Least Durable

Table 2 presents the breaking elongation results of Areca Palm, Snake Plant, and their 50:50 blended fibers. Breaking elongation was measured to assess the elasticity of each fiber type by calculating the percentage increase in length at the point of fracture. The values were interpreted using a standardized elasticity scale.

For Areca Palm fibers, the computed breaking elongation values were 40%, 72%, and 34% across three (3) samples, yielding a mean of 48.67%. Based on the given classification, this result falls into the “Moderately Elastic” category. The



findings indicate that Areca Palm fibers possess a notable capacity to stretch before rupture, demonstrating flexibility suitable for textile applications requiring moderate deformation tolerance. Variations among samples suggest minor structural inconsistencies, which are common in lignocellulosic fibers due to differences in fiber maturity and microfibril orientation. Comparable elongation behavior has been reported for palm-derived fibers, where moderate extensibility was attributed to cellulose–hemicellulose composition and internal fiber bonding (Sathishkumar et al., 2020; Jawaid & Asim, 2021).

Table 2. Breaking elongation of blended Areca Palm and Snake Plant fibers.

Fiber	Variable	Sample 1	Sample 2	Sample 3	Mean	Verbal Interpretation
Areca Palm fibers	Initial Length (in)	5.0	5.0	5.0	–	–
	Elongation (in)	7.0	8.6	6.7	–	–
	Breaking Elongation (EL %)	40	72	34	48.67%	Moderately Elastic
Snake plant fibers	Initial Length (in)	5.0	5.0	5.0	–	–
	Elongation (in)	5.1	5.2	5.5	–	–
	Breaking Elongation (EL %)	2	4	10	5.33%	Least Elastic
Blended Fiber	Initial Length (in)	5.0	5.0	5.0	–	–
	Elongation (in)	6.1	6.4	6.2	–	–
	Breaking Elongation (EL %)	22.0	28.0	24.0	24.67%	Less Elastic

Legend:

Percentage	Verbal Interpretation
81-100	Very Elastic
61-80	Elastic
41-60	Moderately Elastic
21-40	Less Elasticity
1-20	Least Elasticity

Table 3 presents the results of the burning rate test conducted on the textile produced from the blended Areca Palm and Snake Plant fibers. The test evaluated the combustibility of the developed material by measuring the area of flame consumed over a given time. The computed burning rate served as the basis for classification using the established combustibility scale.

In terms of surface area, each specimen measured 1.09 in². The uniformity of area ensured consistent exposure conditions and minimized variability due to specimen size. Because the area remained constant across all trials, differences in burning performance were attributed primarily to time and fiber characteristics rather than dimensional factors.

Regarding burning time, the samples recorded 12.99, 19.44, and 14.13 seconds, yielding a mean of 15.52 seconds. The variation among the three (3) trials suggested minor differences in fiber density, compaction, or internal voids within the textile structure. Nonetheless, the relatively longer average burning time indicated that the blended material did not ignite and propagate flame rapidly. Natural lignocellulosic fibers were known to undergo thermal degradation through the gradual decomposition of hemicellulose and cellulose components, which might delay rapid flame spread depending on fiber arrangement and moisture content (Fiore et al., 2019; Kandola et al., 2021).



Table 8. Rate of burning of textile from blended Areca Palm and Snake Plant.

Fiber	Variable	Sam ple 1	Sam ple 2	Sam ple 3	Mean	Verbal Interpretation
Blend ed Fiber	Area (in ²)	1.09	1.09	1.09	1.09	–
	Time (sec)	12.9 9	19.4 4	14.1 3	15.52	–
	Rate of Burning (in ² /sec)	0.08 4	0.05 6	0.07 7	0.072	Less Combustible

Legend:

Burning rate (in ² /sec)	Verbal Interpretation
0.21-0.30	Highly Combustible
0.16-0.20	Combustible
0.11-0.15	Moderately Combustible
0.06-0.10	Less Combustible
0.01-0.05	Least Combustible

Table 4 summarizes the washability performance of the textile produced from blended Areca Palm and Snake Plant fibers. The test was conducted to determine the material’s resistance to water exposure and to assess any physical changes after soaking under controlled conditions.

Regarding soaking time, all samples were immersed in water for 30 minutes. This uniform duration ensured that each specimen experienced the same level of moisture exposure, providing a consistent basis for comparison. Prolonged immersion was commonly employed in preliminary textile testing to observe swelling behavior, dimensional stability, and fiber bonding responses in natural fiber fabrics.

Table 4. Washability of textile from blended Areca palm and Snake plant.

Fiber	Parameter	Sample 1	Sample 2	Sample 3	Verbal Interpretation
Blended Fiber	Time Soaked (mins.)	30	30	30	–
	Textile Response	No noticeable changes	No noticeable changes	No noticeable changes	Textile maintained integrity; no shrinkage or damage observed

Table 5 presents the water absorption characteristics of the textile developed from blended Areca Palm and Snake Plant fibers. The test determined the material’s moisture-absorption capacity by comparing its initial dry mass with its final mass after immersion. The computed percentage of absorbed water served as the basis for evaluating the textile's absorbency level.

The initial mass of all specimens was consistent at 0.09 g across the three (3) trials. This uniformity showed that the samples were prepared with comparable dimensions and density, thereby ensuring the reliability of the measurements. Controlling the initial weight minimized experimental bias and strengthened the validity of the absorption computation. After immersion, the final mass values increased to 0.33 g, 0.28 g, and 0.32 g, resulting in a mean of 0.31 g. The observable increase in mass confirmed that the textile readily absorbed water. Slight variations among trials likely reflected differences in pore distribution and fiber compaction, which are common in hand-processed natural fiber textiles. The computed water absorbed was 0.24 g, 0.19 g, and 0.23 g, with a mean of 0.22 g. From these data, the textile exhibited a 71% water absorption rate, which fell within the 61–80% classification range and was therefore interpreted as “Absorbent”. This result demonstrated a strong affinity of the blended textile for moisture.

Table 5. Water absorption of textiles from blended areca palm and snake plant.

Parameters	Trials			Mean
	1	2	3	
Final Mass (g)	0.33g	0.28g	0.32g	0.31g
Initial Mass (g)	0.09g	0.09g	0.09g	0.09g
Water Absorbed	0.24g	0.19g	0.23g	0.22g
Percentage				71%
Verbal Interpretation				Absorbent

Legend:

<i>Percentage</i>	<i>Verbal Interpretation</i>
81-100	Very absorbent
61-80	Absorbent
41-60	Moderately absorbent
21-40	Less absorbent
1-20	Least absorbent

Table 06. presents the level of acceptability of the textile produced from blended Areca palm and Snake plant fibers. The evaluation focused on selected sensory and physical attributes, with ratings interpreted using a five-point scale. The computed means reflected the evaluators’ perceptions of the overall quality of the developed textile. All assessed attributes—including hand feel, rib irregularity, color shade, and presence of plugs—received mean ratings within the “Very Acceptable” range. The overall mean score of 4.45 indicated strong general acceptance of the blended textile. The high acceptability ratings highlight the strong potential of the blended Areca Palm and Snake Plant textile as an alternative sustainable fabric. Positive tactile and visual evaluations suggest that the material may be viable for applications in apparel, handicrafts, and decorative products. Moreover, favorable consumer perception is a critical determinant of successful commercialization, particularly in the context of sustainable textile innovation.

Table 06. Acceptability of textiles from blended areca palm and snake plant.

Statement	Mean	Verbal Interpretation
Hand Feel	4.59	Very Acceptable
Irregularity of the ribs	4.37	Very Acceptable
Color Shade	4.54	Very Acceptable
Presence of plugs	4.29	Very Acceptable
Overall Mean	4.45	Very Acceptable

Legend:

<i>Mean</i>	<i>Verbal Interpretation</i>
4.21-5.00	Very Acceptable
3.41-4.20	Acceptable
2.61-3.40	Moderately Acceptable
1.81-2.60	Less Acceptable
1.00-1.80	Least Acceptable

Experimental Procedures

The development of the blended Areca Palm (*Areca catechu*) and Snake Plant (*Sansevieria trifasciata*) textile was guided by a set of carefully defined design criteria to ensure that the final material would be functional, aesthetically acceptable, and suitable for practical applications. The textile was composed of a 50:50 blend of Areca Palm and Snake Plant fibers, intended to balance strength and flexibility while maintaining uniformity through proper cleaning, drying, and fiber alignment before weaving. Mechanically, the fabric was designed to exhibit adequate tensile strength to



withstand handling and light fabrication processes, along with sufficient elongation to allow flexibility without permanent deformation. Chemically and environmentally, the textile was required to demonstrate controlled water absorption, stable dimensional behavior, and predictable thermal properties, including a manageable burning rate, as well as the ability to withstand washing without significant deterioration in texture or structure. Aesthetic and sensory qualities were also prioritized, with the goal of producing a fabric with a uniform color shade, regular ribs, minimal fiber clumps, and a comfortable hand feel that reflects the natural characteristics of the blended fibers. In terms of practical feasibility, the design needed to be compatible with hand-weaving techniques, manageable in sheet form, and suitable for prototype testing, educational demonstrations, craft products, or basic apparel applications. Finally, sustainability considerations were incorporated by using locally sourced, renewable fibers and minimizing chemical or energy-intensive processing, thereby aligning the textile's development with eco-friendly, environmentally responsible practices. Together, these criteria guided the systematic fabrication and evaluation of the blended textile, ensuring that it met the intended functional, structural, and aesthetic objectives of the study.

Preparation of Areca Palm and Snake Plant Fiber

The development of the blended Areca Palm (*Areca catechu*) and Snake Plant (*Sansevieria trifasciata*) textile utilized specific raw plant materials and laboratory supplies to ensure consistent fabrication and testing. For fiber preparation, 10 leaf sheaths of Areca Palm (10 leaf sheaths, 45.72 centimeters each) and 20 leaves of Snake Plant (20 leaves, 45.72 centimeters each) were collected and processed. These quantities were chosen to provide sufficient fiber for blending, weaving, and subsequent testing while maintaining uniformity in size and quality. The fabrication of the textile produced a material of one-half yard in length and 15 inches in width (½ yard blended textile), which was further cut into 12 small swatches (12 pieces, 1.19 in² each) for evaluation of mechanical, chemical, and sensory properties. These swatches were used to standardize testing and allow comparison across all measured parameters. For the chemical and functional assessments of the blended textile, several materials were used in controlled quantities. One hundred milliliters (100 ml) of tap water were poured into a beaker for water absorption and washability tests, while five (5) grams of detergent powder (5g) were used to simulate washing conditions. Additional laboratory items included one (1) roll of masking tape, one (1) pencil, one (1) pentel pen, one (1) roll of tissue paper, and one (1) piece lighter. These materials were used to facilitate accurate testing, mark measurements, and conduct safe burning tests. By carefully specifying the quantity and size of both plant fibers and supporting materials, the study ensured that the blended textile could be reproducibly developed and tested. The combination of precise raw materials, laboratory supplies, and prepared swatches provided a systematic foundation for evaluating the mechanical strength, chemical behavior, and sensory acceptability of the final textile product preserving their natural flavor compounds. After boiling, the vegetables were drained and allowed to cool slightly. All ingredients were then weighed and measured precisely according to the predetermined formulation proportions to ensure consistency and reproducibility of the mixture.

A clean cooking pan was prepared, and the measured ingredients were subjected to their respective heat treatments based on the formulation requirements. Once fully cooked, the mixture was transferred into a food-grade blender and processed until a uniform, smooth paste was obtained. This blended mixture served as the sinigang flavor base and was set aside under hygienic conditions for subsequent use in the product formulation.

Preparation of Textile from Areca Palm and Snake Plant

After extraction, the fibers underwent drying. Once completely dry, the fibers were collected and tied into bundles to prevent tangling and moisture exposure until they were ready for weaving. The next stage involved weaving the blended fibers. The dried fibers were combined in a 50:50 proportion to balance the tensile strength of Areca Palm with the flexibility of Snake Plant fibers.

Research Instrument

Sensory evaluation aimed to determine the subjective perception of the textile regarding hand feel, color shade, rib irregularity, and the presence of plugs. A total of 25 evaluators, including students, TLE teachers, fashion designers, and dressmakers, assessed the swatches using a structured rating scale ranging from 1 (Not Acceptable) to 5 (Highly Acceptable). Evaluators were instructed to handle the textiles gently, observe the visual and tactile qualities, and provide individual ratings for each attribute. The collected data were tabulated and analyzed to identify trends in acceptability, highlighting the strengths and areas for improvement of the blended textile.



VALIDATION OF INSTRUMENT

In this study, the blended Areca Palm (*Areca catechu*) and Snake Plant (*Sansevieria trifasciata*) textile was evaluated using multiple parameters to determine its mechanical, chemical, and sensory properties. A total of 25 evaluators, including students, local dress shop owners, fashion designers, and dressmakers, assessed the product's texture and 86 workmanship. The specific sensory attributes evaluated included the presence of plugs, rib irregularity, color shade, and color variation. Data from these evaluations were recorded, tabulated, and analyzed to establish the overall acceptability of the textile. For mechanical properties, breaking elongation (breaking strain) was measured to assess the elasticity of the blended textile. Fifty-centimeter (50 cm) strands of each fiber were tied to a spring balance and pulled until fracture, with the percentage of elongation.

COLLECTION OF DATA

Data for the study were collected through a combination of experimental trials and product evaluation. The development of the blended Areca Palm (*Areca catechu*) and Snake Plant (*Sansevieria trifasciata*) textile involved three (3) separate trials to ensure accuracy and consistency in the final product. Once the textile was completed, it underwent sensory evaluation by 25 expert evaluators, including local dress shop owners, fashion designers, and dressmakers. Respondents were selected for their relevant expertise, ensuring their observations and judgments provided meaningful insights into the textile's functional and aesthetic qualities. Their qualifications included knowledge of fabrics, sewing techniques, color perception, design visualization, measurement accuracy, creativity, and the ability to critically assess garment and material performance.

STATISTICAL TOOLS AND ANALYSIS

The data gathered were analyzed using 5point Likert scale. The mean was used to determine the sensory qualities and general acceptability of the product.

III. PRESENTATION, ANALYSES, AND INTERPRETATION OF DATA

Areca Palm and Snake Plant. The results were analyzed to determine their durability and suitability as classifications. alternative textile materials using standardized tensile-strength For the Areca Palm fibers, tensile strength values across the three (3) samples were 34.3, 34.3, and 36.95 N/mm², yielding a mean of 34.95 N/mm². Based on the established rating scale, this value fell within the "Durable" range. The uniform fiber load of 10 kgf applied to all samples indicated consistent testing conditions. The relatively stable tensile values suggested that Areca palm fibers possessed moderate structural integrity, making them capable of withstanding mechanical stress during textile use. Previous investigations into palm-based natural fibers reported comparable tensile ranges, emphasizing their suitability for semi-structural and textile reinforcement applications (Kumar et al., 2019; Ramesh et al., 2018). In contrast, the Snake plant fibers demonstrated higher tensile strengths of 49, 48.02, and 39.2 N/mm², yielding a mean of 40.83 N/mm². This mean value corresponded 94 95 to the "Very Durable" classification. Although one sample showed a slightly lower value, the overall performance indicated superior mechanical strength compared to Areca palm fibers. The literature has consistently reported that *Sansevieria trifasciata* fibers possess high cellulose content and strong microfibrillar orientation, which contribute to enhanced tensile performance (Sathishkumar et al., 2020; Thakur & Thakur, 2017). The blended fiber combination (50:50 proportion) produced tensile strength values of 44.1, 45.08, and 45.08 N/mm², with a computed mean of 44.75 N/mm². This result also fell into the "Very Durable" category and demonstrated greater strength than Areca Palm alone. The findings suggested that blending enhanced overall fiber performance, likely due to improved stress distribution and inter-fiber bonding. Recent studies on hybrid natural fiber systems reported that blending fibers with complementary mechanical properties often resulted in synergistic strength enhancement (Fiore et al., 2019; Jawaid & Asim, 2021). The results revealed that Snake Plant fibers exhibited the highest tensile strength among the individual fibers tested, followed by the blended fiber, and then Areca Palm fibers. Notably, the blended fibers achieved a higher durability classification than Areca Palm alone, indicating that fiber hybridization improved mechanical performance.

Summary of Findings

The developed textile, produced from blended Areca Palm (*Areca catechu*) and Snake Plant (*Sansevieria trifasciata*) fibers, was designed as an alternative material for textile applications. By integrating the moderate flexibility of Areca Palm fibers with the structural strength of Snake Plant fibers, the product demonstrated balanced mechanical performance, satisfactory moisture absorption, controlled burning behavior, and high user acceptability. As a plant-based, biodegradable material, the blended textile offered environmental benefits while maintaining functional qualities



suitable for garments, handicrafts, and light household applications. The study aimed to develop an alternative textile material by blending Areca Palm and Snake Plant fibers, guided by three (3) key objectives. First, it sought to determine the mechanical properties of the blended fibers, including tensile strength and breaking elongation. Second, it aimed to evaluate chemical properties—specifically burning rate, washability, and water absorption. Finally, the study aimed to assess the acceptability of the blended textile through sensory evaluation of color shade, hand feel, rib irregularity, and the presence of plugs. Collectively, these objectives guided the experimental development, testing, and assessment of the blended Areca Palm and Snake Plant textile as a viable, eco-friendly alternative for the local and, potentially, broader textile industry. A developmental research design was employed to produce and evaluate a blended textile made from Areca Palm and Snake Plant fibers in a 50:50 proportion. The methodology involved three (3) main phases: design and preparation, fiber extraction and weaving, and evaluation of the finished textile. For the evaluation phase, the study measured the mechanical, chemical, and sensory properties of the blended textile. Mechanical testing included tensile strength using a Universal Testing Machine and breaking elongation measured with a spring balance. Chemical properties were assessed through burning rate tests using an alcohol lamp, water absorption using a digital balance, and washability by soaking textile swatches in a detergent solution. Sensory acceptability was evaluated based on color shade, hand feel, irregularity of the ribs, and presence of plugs. A total of 25 evaluators, including local dress shop owners, fashion designers, and dressmakers, were selected based on their expertise in textile assessment and fashion knowledge. Data collected from three trials were analyzed using mean values and standardized rating scales, while formulas such as tensile strength ($TS = Load/\pi r^2$), breaking elongation ($\epsilon = \frac{L - L_0}{L_0} \times 100$), and water absorption ($\% = \frac{FM - IM}{IM} \times 100$) were applied to quantify fiber performance. Parameters of analysis included texture, workmanship, elasticity, durability, combustibility, water absorption, shrinkage, and overall acceptability, ensuring a comprehensive assessment of the textile's potential as a sustainable alternative material. The integration of the two fibers contributed to improved load distribution within the textile matrix.

IV. CONCLUSION

The following conclusions were derived from the analysis of the mechanical, chemical, and user acceptability properties of the blended textile made from Areca Palm and Snake Plant fibers.

The blended textile demonstrated moderate elasticity, classified as less elastic, while maintaining strong tensile strength. This result concludes that combining Areca Palm and Snake Plant fibers yields a material that balances flexibility and structural strength, making it suitable for light- to medium-weight textile applications. The blended textile material demonstrated favorable functional properties, with a low burning rate of 0.072 in²/sec, indicating controlled flammability and good fire resistance. Washability tests confirmed that the textile retained its structural integrity after soaking, while water absorption reached 71%, categorizing it as absorbent. Collectively, these results suggest that the developed Areca palm–Snake plant textile possesses adequate safety, resilience, and moisture-handling capacity. Its combination of fire resistance, wash durability, and absorbency highlights its potential as a sustainable alternative material suitable for practical textile applications, particularly in eco-friendly apparel, household fabrics, and other products where both functionality and environmental performance are valued. The sensory evaluation confirmed that the blended textile was highly acceptable across all assessed parameters. The highly acceptable sensory qualities of the blended textile reflect strong user approval in both tactile and visual dimensions, indicating that the product meets the aesthetic and practical expectations of potential users. The blended 116 Areca Palm and Snake Plant textile possesses qualities that enhance consumer satisfaction and usability, reinforcing its potential as a sustainable alternative material for apparel, handicrafts, and decorative applications. The consistently high acceptability ratings further highlight its viability for broader adoption in eco-friendly textile innovation and commercialization.

RECOMMENDATIONS

Based on the findings and conclusions of this study, the following recommendations are proposed to advance the development, utilization, and further research of blended Areca Palm and Snake Plant textiles. These suggestions aim to enhance the material's mechanical and chemical performance, broaden its application range, and support sustainable production and use. Further research explores material optimization by testing different blending ratios of Areca Palm and Snake Plant fibers. Adjusting the proportions can improve tensile strength, elasticity, and durability, making the textile more versatile for various applications. Additionally, applying chemical or natural treatments to the fibers, such as softening agents, water-repellent finishes, or anti-shrink solutions, could further enhance performance without compromising the material's sustainability. In terms of textile design and product development, it is advisable to expand the use of blended fibers into practical products such as mats, bags, upholstery, and garments. Doing so would allow the evaluation of the textile's functional performance under real world conditions and provide insight into its adaptability for everyday use. Experimenting with weaving techniques, patterns, and finishing methods may also



enhance the textile's overall aesthetic appeal while maintaining its structural integrity. To enhance sensory and acceptability aspects, additional consumer-based assessments are recommended. Engaging a larger and more diverse pool of evaluators may provide more robust feedback on factors such as hand feel, texture, color uniformity, and presence of plugs. Incorporating natural dyeing methods compatible with these fibers may enhance color vibrancy and consistency, creating textiles that are both visually appealing and environmentally friendly. In line with sustainability and eco-friendly practices, the study encourages the continued use of agricultural by-products, such as Areca Palm sheaths and Snake Plant leaves, as raw materials.

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